TECHNICAL REPORT SERIES NO. 120 December 1990

Urbanization in the Lower Fraser Valley, 1960-1987

Kathleen E. Moore

CANADIAN WILDLIFE SERVICE / PACIFIC AND YUKON REGION

Résumé

Ce rapport traite de l'impact de l'urbanisation sur les terres agricoles et les habitats fauniques de la vallée inférieure du fleuve Fraser, en Colombie-Britannique, entre 1960 et 1987. Vancouver, la troisième plus grande région métropolitaine du Canada, et certaines des terres agricoles les plus productives du pays se trouvent dans cette région. En outre, l'estuaire et le delta du Fraser abritent des populations d'oiseaux migrateurs et d'autres espèces fauniques d'importance internationale. Au total, 4 354 ha de terres rurales ont été urbanisés entre 1960 et 1987. Près de la moitié de cette superficie était constituée de zones naturelles non perturbées, et le quart était exploité à des fins agricoles.

Plus de 750 ha de terres rurales ayant un potentiel agricole élevé ont été perdus de façon permanente en raison de l'urbanisation, tandis que la plus grande partie des nouveaux secteurs mis en culture présentait un potentiel agricole moins élevé.

L'urbanisation a altéré un grande nombre des habitats fauniques qui restaient dans la vallée inférieure du Fraser, y compris des milieux humides, des prairies et des forêts, ce qui a entraîné des modifications dans la composition et la répartition des espèces fauniques.

Malgré l'augmentation prévue de la population humaine dans la vallée inférieure du Fraser, il est possible d'éviter d'autres empiètements sur les terres agricoles et les habitats fauniques de choix. Beaucoup de terres ayant un potentiel agricole et faunique peu élevé peuvent encore être utilisées à des fins urbaines. Orienter la croissance urbaine de façon qu'elle n'empiète pas sur les terres de choix et leurs ressources renouvelables nécessite un engagement évident face au maintien de la viabilité des ressources agricoles et fauniques de la région.

Introduction

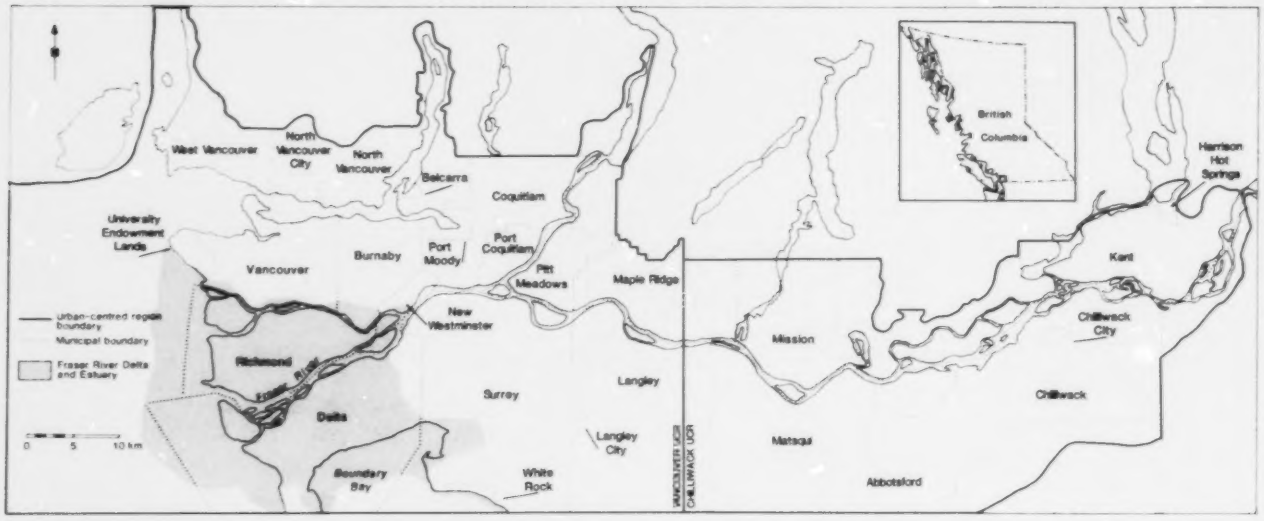
Some of Canada's most important agricultural land and wildlife habitat is located in British Columbia's Lower Fraser Valley. This area forms part of the nation's limited supply of prime renewable resource lands - lands with a high capability for agriculture, wildlife or forestry. The Lower Fraser Valley is also the location of Vancouver, Canada's third largest metropolitan area (Figure 1). While competition between urban and renewable resource activities is common in the rural fringes of Canadian cities, it is particularly acute in the Lower Fraser Valley.

Between 1981 and 1986 the Lower Fraser Valley had one of the fastest growth rates in the country (9.1%). By

Competing demands for the use of rural land: houses, golf courses, farms, wildlife habitat. (photo: Dave W. Smith/Canadian Wildlife Service)

Environment Canada Canadian Wildlife Service
Environnement Canada Service canadien de la faune
A member of the Conservation and Protection family
Canada

Figure 1. The Lower Fraser Valley



1986 approximately 1.5 million people, over 50% of the population of British Columbia, lived there (Statistics Canada 1988). The population growth rate is expected to remain high due to the attractive climate, landscape, and economy. However, urban growth is constrained by the surrounding mountains, rivers, the ocean, the United States border and by competing demands for agricultural use and wildlife habitat preservation.

Only the lower elevations and valley bottoms, about 10% of British Columbia's total land area, are suitable for human settlement. These are often the locations of the province's most productive farmland. The Lower Fraser Valley is one of only two regions in B.C. with nationally significant agricultural production. It is the nation's sole commercial producer of hops and filberts and the largest producer of cranberries and raspberries. The other important region is the Okanagan Valley, one of Canada's few locations suitable for commercial tree fruit and grape production.

About 7% of the province's prime agricultural land is located in the Lower Fraser Valley. However, due to a favourable climate and proximity to markets, it accounts for at least 55% of the total dollar value of B.C.'s annual agricultural production (Statistics Canada 1987). Almost 40% of the approximately 30 000 people employed directly in the B.C. agriculture industry are located in the Lower Fraser Valley (B.C. Ministry of Agriculture and Fisheries 1990). This figure does not include those people involved in related industries such as transportation and food services. The food processing and agri-industry sector in this region have an annual output valued in excess of $3 billion (B.C. Agricultural Land Commission 1990a).

Fish and wildlife are abundant in the Lower Fraser Valley because of the diverse habitats of the Fraser River Delta and adjacent estuarine waters*. The Fraser River is home to approximately 80 species of finfish and shellfish, and is the largest single salmon producing stream in the world (Langer 1989). In addition, the Fraser River Delta serves as an internationally important stopover for migratory birds on the Pacific Flyway. In winter, it supports the highest densities of waterfowl, shorebirds, and raptors in Canada (Butler and Campbell 1987).

This technical report provides data on the conversion of rural land to urban uses in this very important region. It also discusses the impact of urbanization on high capability agricultural land and wildlife habitat.

*Any further references to the Fraser River Delta include the estuarine waters and tidal flats.

Table 1. Land-use change in the Lower Fraser Valley between 1980 and 1987 (in hectares)

	VANCOUVER		CHILLIWACK		TOTAL		TOTAL CHANGE	TOTAL % CHANGE
	1982	1986	1980	1987	1980/82	1986/87	1980-1987	1980-1987
URBAN	**69 765**	**72 341**	**17 269**	**19 047**	**87 034**	**91 388**	**+4 354**	**+5.0**
DWELLING	**11 770**	**13 240**	**9 084**	**10 273**	**20 854**	**23 513**	**+2 659**	**+12.8**
High density	6 873	8 314	4 429	5 181	11 302	13 495		
Low density	4 897	4 926	4 655	5 092	9 552	10 018		
OTHER URBAN	**7 487**	**8 593**	**3 943**	**4 532**	**11 430**	**13 125**	**+1 695**	**+14.8**
Commercial, manufacturing, and storing	2 427	2 876	562	769	2 989	3 645		
Transportation and communication	3 259	3 772	1 565	1 764	4 824	5 536		
Institutional	943	994	1 509	1 560	2 452	2 554		
Recreational and cultural sites	858	951	307	439	1 165	1 390		
URBAN CORE	**50 508**	**50 508**	**4 242**	**4 242**	**54 750**	**54 750**	**0**	**0.0**
RURAL	**105 459**	**102 883**	**115 234**	**113 456**	**220 693**	**216 339**	**-4 354**	**-2.0**
AGRICULTURAL	**42 836**	**42 931**	**51 253**	**51 027**	**94 089**	**93 958**	**-131**	**-0.1**
Improved grassland (for grazing or silage)	26 275	24 326	34 795	30 626	61 070	54 952		
Annually tilled row and close grown crops	9 182	10 122	6 352	9 141	15 534	19 263		
Unimproved grassland (for some grazing)	3 163	2 945	5 148	4 342	8 311	7 287		
Fruit and berry production	2 075	3 072	2 609	4 318	4 684	7 390		
Other productive-land agriculture	624	804	891	1 011	1 515	1 815		
Site agriculture (e.g. greenhouses, stables)	1 517	1 662	1 458	1 589	2 975	3 251		
EXTRACTION	**1 863**	**1 670**	**605**	**876**	**2 468**	**2 546**	**+78**	**+3.2**
RECREATION AND CONSERVATION	**22 198**	**22 323**	**2 318**	**2 574**	**24 516**	**24 897**	**+381**	**+1.6**
Land dependent recreation	16 945	17 053	1 916	2 083	18 861	19 136		
Conservation and wildlife	5 253	5 270	402	491	5 655	5 761		
FORESTRY	**1 150**	**1 327**	**15 933**	**16 870**	**17 083**	**18 197**	**+1 114**	**+6.5**
LAND IN TRANSITION	**1 798**	**1 762**	**178**	**554**	**1 976**	**2 316**	**+340**	**+17.2**
UNDISTURBED (no perceived activity)	**33 303**	**31 159**	**44 510**	**41 181**	**77 813**	**72 340**	**-5 473**	**-7.0**
IDLE	**2 287**	**1 705**	**437**	**374**	**2 724**	**2 079**	**-645**	**-23.7**
UNCLASSIFIED	**24**	**6**	**0**	**0**	**24**	**6**	**-18**	**-75.0**
TOTALS	175 224	175 224	132 503	132 503	307 727	307 727		

Historical Urbanization in the Lower Fraser Valley

European contact with the Lower Fraser Valley began in 1808 with Simon Fraser's expedition to the mouth of the Fraser River (Borden 1966). In the 1820's, Hudson's Bay Company employees based at Fort Langley began farming in Langley Prairie, a short distance away. Initially, their grain and dairy products were primarily to meet the needs of the fort, but later were also traded to Russian fur traders from Alaska. The Hudson's Bay Company, citing incompatibility with fur trading, discouraged private settlement in the area. This continued until the 1858 Gold Rush along the Fraser River in the Cariboo region provided a continual demand for farm produce (Winter 1966).

New farms and settlements were concentrated first in the eastern half of the valley but spread quickly throughout the region, particularly after a network of dykes was built to control flood waters. Agriculture and urban activities were restricted primarily to level terrain for several decades until techniques were firmly established to clear the thick upland forest stands and tree stumps (Siemens 1966). Thereafter, the area of natural woodland was reduced substantially. The population increased steadily with the development of railways and ports, and subsequently with highways, bridges, and airports.

Urbanization in the Lower Fraser Valley 1980-1987

Rural-to-urban Land Conversion

To evaluate land-use trends in this region, the data for two urban-centred regions (UCRs) have been combined. Detailed land-use change information is available for the Vancouver UCR for the period 1982-1986 and for the adjacent Chilliwack UCR for 1980-1987 (Figure 1). Together they represent metropolitan Vancouver and the maximum extent of its commuter hinterland. This encompasses an area of just over 300 000 hectares (ha) and approximates the area known as the Lower Fraser Valley.

Altogether 4 354 ha of rural land were urbanized in the Lower Fraser Valley between 1980-87; 2 576 ha in the Vancouver UCR and 1 778 ha in the Chilliwack UCR (Table 1). This translates to an annual conversion rate of 644 ha/year for Vancouver and 254 ha/year for Chilliwack. Together, this is equivalent to a community being created every year of about one and a half times the land area of White Rock. In Vancouver over the four-year period, the urbanized area increased 3.7% and in Chilliwack, the urbanized area increased 10.3% over the seven-year period.

A good index of how efficiently land is being converted is derived from the number of hectares urbanized per 1 000 increase in population. A high rate indicates low-density use of land. Vancouver had a rate of 28 ha/1 000 increase in population and Chilliwack converted 89 ha/1 000. This is consistent with the pattern across Canada in that the larger UCRs converted land more efficiently than did small ones (Table 2).

Table 2 Area urbanized per 1 000 increase in population (in hectares)

Chilliwack	89
Vancouver	28
Lethbridge	116
Calgary	78
Brandon	137
Winnipeg	63
Kingston	73
Toronto	36
Jolliette	156
Montreal	55
Moncton	222
St. John's	86
Halifax	52

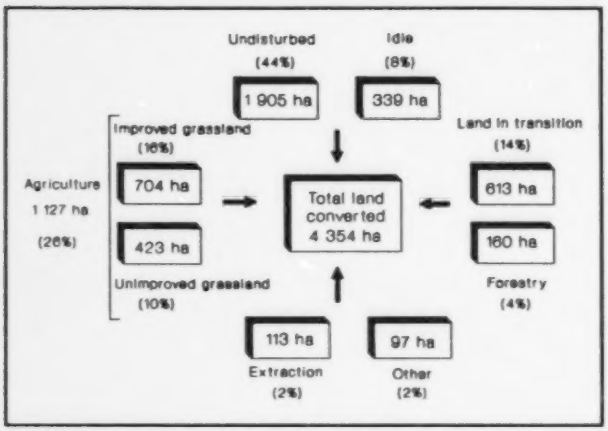
(after Warren, Kerr and Turner 1989, supplementary tables).

Former Uses of Urbanized Land

Just over 1 900 ha or 44% of the land urbanized between 1980-1987 had been classified previously as undisturbed (areas with a natural cover of woods, shrubs, grasses or rock) (Figure 2). Large forest tracts on the fringes of the study area and isolated woodlots near new subdivisions in Surrey, Langley, Matsqui, and Mission accounted for most of this previously undisturbed land. Nearly 900 ha were cleared for high density housing developments and 450 ha were selectively cleared for low density housing. And, as an indication of future development, nearly 700 ha of undisturbed lands became classified as land in transition. These are areas that were being prepared for urban development at the time of the study.

Twenty-six percent (1 127 ha) of the rural land urbanized between 1980-1987 had been in either of two agricultural

Figure 2. Classification of rural land converted to urban uses between 1980 and 1987



uses (Figure 2). One was forage crop production and grazing on improved grassland, and the other was grazing on unimproved grassland. Improved grasslands are newly seeded fields with high productivity, and unimproved grasslands are weed-encroached older fields of lower nutritional value. The conversion of these farmlands to urban uses occurred most often in Surrey, Langley, Matsqui, and Chilliwack. Slightly less than 94 000 ha or about one-third of the study area remained in some type of agricultural use in 1986/87 (Figure 3).

Fourteen percent of the area urbanized between 1980 and 1987 was in locations that had been classified as land in transition in 1980 (Figure 2). At that time, these areas were undergoing significant disturbance in preparation for urban development. The total amount of land in transition changed little in the Vancouver UCR between 1982 and 1986 but more than tripled in the Chilliwack UCR between 1980 and 1987. That indicates that development was occurring more rapidly in the eastern portion of the Lower Fraser Valley where house prices can be half of those found in the western portion (Canada Mortgage and Housing Corporation 1990a).

Just under 340 ha (8%) of the land urbanized had been classed as idle (Figure 2). That category represents land that had formerly been in use (e.g. for agriculture or forestry) but had since been abandoned. A large portion of the idle land that became urbanized in the study period can be attributed to the reactivation of Boundary Bay Airport in Delta.

Near Mission and east of Chilliwack, 160 ha of land previously used for forestry activities were urbanized. These usually consisted of small lots that had undergone sporadic clearing, not the large-scale commercial clearcuts located on the fringes of the study area which remained in forestry use.

Extraction and other activities each accounted for 2% of the total rural land converted (Figure 2). One hundred and thirteen hectares of deactivated gravel pits, peat mining sites, and rock quarries were redeveloped into urban uses such as housing and landfills. The category "other" is a composite of several rural activities that became urbanized, such as site agriculture (e.g. farm buildings, feed lots) and horticultural nurseries.

Implications for Agricultural Land

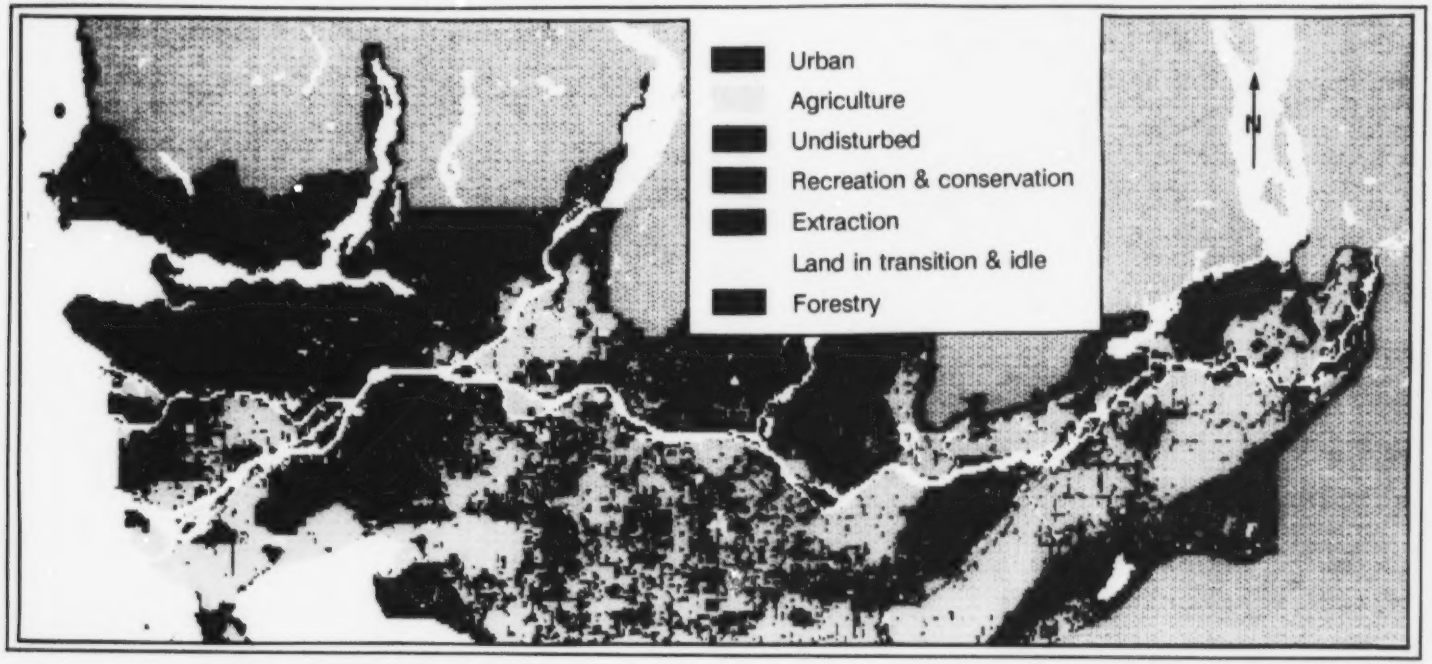
Much of the Lower Fraser Valley is intensively farmed and produces many specialty crops not commercially grown elsewhere in Canada. Despite its importance, the region's prime agricultural land has been, and continues to be lost to urbanization.

A total of 4 354 ha of rural land were permanently lost to urban uses between 1980 and 1987. Figure 4 displays the agricultural capability ratings of this land. Agricultural capability indicates the range of crops that can be grown*. Class 1-3 lands have the capability to grow the widest range of crops including vegetables, fruits, cereal grains, specialty crops, and forage crops. Lands rated Class 4, 5, or 6 support a progressively narrower range of crops because of physical and climatic limitations. The lower capability lands are limited to forage crop production, permanent pasture, and natural rangeland. Nearly 750 ha (17%) of the rural land urbanized in the Lower Fraser Valley had been prime agricultural land with a high agricultural capability rating (Class 1-3).

One-quarter (1 127 ha) of the rural land urbanized had been actively farmed prior to conversion. Farmland classified as idle (abandoned), and undisturbed lands having an agricultural potential are not included in this total. One-third (348 ha) had been high capability agricultural land. In comparison, of the 1 138 ha of undisturbed land cleared for new agricultural production, only one-quarter (284 ha) had a high capability.

* For a description of the Canada Land Inventory (CLI) classification system for agricultural capability, see Environment Canada 1976. The CLI statistics are based on an "unimproved" rating. A more detailed inventory has since been done for the region which gives both the "improved" and "unimproved" ratings. It indicates that more farmland could be considered high capability when improved by standard farm practices.

Figure 3 Land use in the Lower Fraser Valley 1986/87

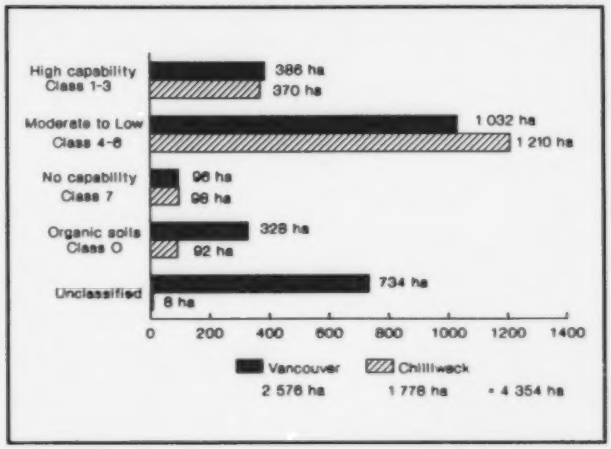


This map was produced using SPANS, a micro-computer based Geographic Information System (GIS)

Scale 1:600 000

0 20 km

Figure 4. CLI agricultural capability of rural land converted to urban uses between 1980 and 1987



Thus, while Table 1 indicates that there was essentially no change in the total area of land used for agriculture in the region between 1980 and 1987, Figures 2 and 4 reveal two significant trends. One is that agricultural land is second only to undisturbed land as a target for new urban activities. Secondly, new areas put into agricultural production are more likely to be of lower agricultural capability and productivity than that of the farmland lost to urbanization.

Urbanization creates a larger market for agricultural products, particularly for horticulture and specialty crops. As a result, there is now a trend toward a more intensive use of farmland. Between 1980 and 1987, the area in annual tillage crops and close grown crops (e.g. grains) increased by 24%, primarily in Delta, Surrey, Abbotsford, and Chilliwack. The area in berry production increased 58% in Pitt Meadows, East Richmond, and Abbotsford. Most of the increase came from farmlands previously used for forage crop production and grazing on improved grassland. Only a small fraction came from undisturbed areas. Forty-five percent of the new berry-growing areas, and 67% of the new tillage crop areas had high agricultural capability.

The trend towards intensive farming has implications for soil degradation. Replacement of improved and unimproved grasslands with "exposed soil" crops such as vegetables and strawberries can result in a greater risk of severe soil erosion (Runka 1990). In addition, greater applications of pesticides and fertilizers used in intensive farming, and manure stockpiling on poultry and livestock farms may create soil and water pollution.

Gains in agricultural production obtained with more intensive use of a shrinking agricultural land base cannot continue indefinitely. Replacement of prime Lower Fraser Valley farmland with lands of similar capability in less populated parts of B.C. is not a viable option. The climate in these areas may be totally unsuitable for some crops or may be economically unsuitable because of substantially higher costs. Additionally, developing these lands for agriculture may adversely affect their forest and wildlife habitat resources.

From a national perspective, the continual, incremental loss of prime agricultural land has profound consequences for future sustainable agriculture. Reducing the range and quantity of agricultural products capable of being grown domestically will result in a decline in numerous jobs in farming and the food processing industry, and also in the nation's balance of payments. These products would have to be imported year-round to compensate for the loss of the seasonal domestic supply. In addition, loss of prime farmland from urbanization is a world-wide problem. The diverse and affordable foods from other countries may not exist tomorrow as nations strive to feed and house their own expanding populations.

Implications for Wildlife Habitat

The Fraser River Delta is a critical stopover for birds migrating along the Pacific Flyway route spanning from Siberia to South America (Fraser River Estuary Study

Site preparation of prime agricultural land for housing (photo: Kathleen E. Moore/Canadian Wildlife Service)

Steering Committee 1978). But urbanization has had, and will continue to have, a profound effect on the natural wildlife habitat of this internationally significant area. Just under one-third of the land that became urbanized here between 1967 and 1982 had been natural wetlands. Most of the remainder had been agricultural land (Pilon and Kerr 1984).

Prior to the settlement of the Lower Fraser Valley in the last century the distribution of wildlife species was different from that of today. The change occurred because dyking, draining, and clearing for urban and agricultural development reduced or altered many of the original natural habitats such as wet meadows, salt marshes, bogs, and wooded habitats. For example, in 1878 Sumas Lake in the eastern part of the valley was identified as a major impediment to east-west land transportation and as a potential source of new farmland. It was drained and dyked by 1924. About 3 600 ha of lake bed were exposed and another 8 000 ha of surrounding marshland and sloughs were secured from flooding (Siemens 1966). As the water table dropped, the marshes disappeared, along with the significant populations of ducks and geese they once supported (Leach 1982). The composition of wildlife species also changed to one which could utilize farmland.

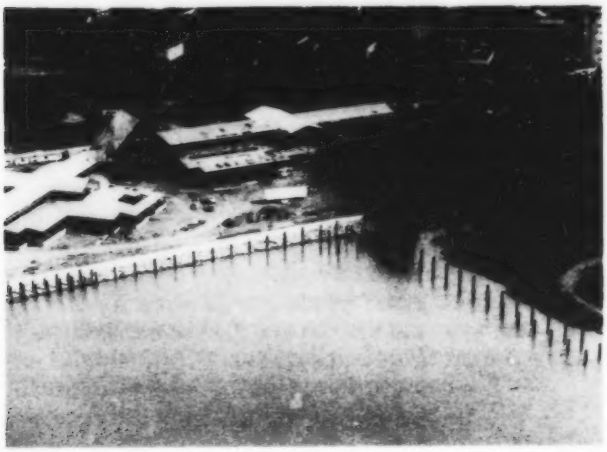
The process of settlement had a lesser impact on other wetland habitats. For example, while the dyking system led to the loss of brackish marshes in one area, the construction of river training walls resulted in the accretion of sediments in other areas where new brackish marshes colonized. Those marshes contribute to the high productivity of the Fraser River Estuary. That productivity supports a complex food web which includes diverse and abundant populations of invertebrates, fish, mammals, and birds.

Fraser River industrial development on wetland habitat (photo: Gary L. Williams/G.L. Williams and Associates)

Changes in habitat due to urbanization and agricultural development have affected some wildlife species more than others. Since the mid 1800's, nine wildlife species have been displaced from the Fraser River Delta and five more are threatened. Similarly, woodland birds (e.g. grouse) and mammals (e.g. black bears), once widespread on the Fraser River Delta, are now limited to isolated woodlots such as those in Burns Bog (Butler and Campbell 1987). In contrast, the expansion of the urban environment has been favorable to adaptable species such as starlings, crows, and gulls. The latter two have been particularly successful in exploiting garbage dumps as a food source (Butler and Campbell 1987).

Despite the overall decline in original natural habitats, the Fraser River Delta, including Boundary Bay, continues to support large numbers of resident wildlife and wintering migratory birds. In some years as many as 1.4 million birds migrate through the Fraser River Delta (Butler and Campbell 1987). Many species have been successful in supplementing the use of remaining natural habitats with agricultural land. Farmed lands, particularly seasonally flooded pastures and cultivated fields, attract large numbers of waterfowl and shorebirds which feed on grasses, weeds, insects, and unharvested crops. Uncultivated old fields provide critical winter feeding habitat for Great Blue Herons, and both nesting and feeding habitat for raptors such as Short-eared Owls and Northern Harriers. Hedgerows and woodlots adjacent to farmland also provide important habitat. Many raptors use trees for nesting, roosting, and as bases for hunting.

Agricultural fields can have other impacts on wildlife. In addition to the potentially harmful effects of pesticides and fertilizers, changes in farm practices ranging from a simple crop rotation to a complete replacement of uncultivated old fields with more intensive crop production can alter wildlife species distribution. That may become more evident with the trend toward cash crops such as berries and greenhouse and nursery products. For instance berry fields are not attractive to waterfowl but are to birds such as starlings and robins. Further losses in natural habitat or agricultural land used by wildlife would tend to concentrate existing wildlife populations onto fewer fields and increase the likelihood of more extensive crop damage. Wildlife control measures would be increasingly



Portion of a wetland filled and dyked for urban expansion (photo: Otto E. Langer/Fisheries and Oceans Canada)

needed to minimize the impact on crops, but a decreasing number of alternate habitats would inevitably result in a reduction in carrying capacity and in population declines.

Despite the recognition of the need to maintain natural habitats in order to support wildlife populations and minimize impacts on agricultural land, very little of the remaining tidal flats, brackish and salt marshes, wet meadows, old fields, and bogs have been formally set aside for wildlife use. For example, it has been estimated that only 1% of the Fraser River Delta is formally protected (Butler and Campbell 1987). Table 1 indicates that the total area classified as being used for conservation and wildlife activities behind the dykes and above high tide was 5 761 ha or 2% of the Lower Fraser Valley in 1986/87. Figure 3 shows that the forests of the Greater Vancouver Watershed accounted for most of this. Any additional losses in size or quality of the other habitat types may ultimately render them valueless to wildlife.

Trends and Directions

The favourable climate, soils, diverse landscapes, and economic opportunities of the Lower Fraser Valley will continue to attract large numbers of people. Since 1987 there has been a tremendous housing boom in this area. The years 1988 and 1989 recorded the highest number of housing starts of the decade. The total housing starts for these two years was one-third of that recorded for the previous eight years (Canada Mortgage and Housing Corp. 1990b).

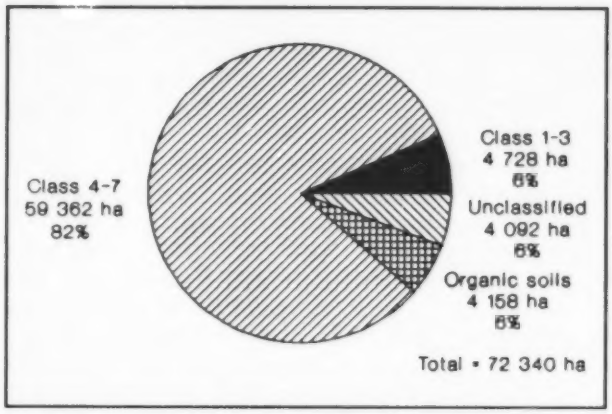
By the year 2001, this area is projected to have a population of almost 2 million. If past trends continue another 29 000 ha could be urbanized by 2001. While there might be fluctuations due to changing economic conditions, the land-use competition between urban, industrial, recreational, agricultural, and wildlife interests is likely to remain acute. These population pressures will also affect the quality of the region's air, water and soil, which is already a major concern (B.C. Ministry of Environment 1985).

Urban expansion in the lowlands, where development costs are less, is curbed somewhat by the Agricultural Land Reserve (ALR). Established in 1974, the ALR includes over 135 000 ha of land in the Lower Fraser Valley. Non-farm use in the ALR is restricted and urban and industrial development can normally proceed only after complete withdrawal from the ALR. In the period between 1974 and 1987, the area of ALR land in the study area had a net decline of 5.5% or approximately 620 ha/year. Between 1980 and 1987 alone, there was a net decline of 3 604 ha, and applications for further withdrawals continue to be filed (B.C. Agricultural Land Commission 1990b). Traditional conflicts between urban and farm uses including complaints of vandalism, traffic, odour, and noise, tend to promote this attrition. Local governments may respond to complaints from non-farm populations by implementing restrictive bylaws against normal farm practices. Several provinces, including British Columbia, have developed "Right to Farm" legislation to protect farmers from unwarranted nuisance suits.

One of the few non-farm uses now permitted within the ALR are golf courses. The rising popularity of golfing has spawned an increase in permit applications to municipalities and the Agricultural Land Commission. However, for economic reasons golf courses are unlikely to ever revert back to agricultural production. The combination of high property values as well as costs to mitigate some of the changes in soil structure that occur during construction of the course would preclude reestablishing a viable farming operation. In addition, golf courses tend to attract interest in developing associated housing and commercial uses, thereby inflating the value of adjacent farmland. This inevitably invites applications for complete withdrawal of these neighbouring properties from the ALR. The growing uncertainty and instability introduced into the agricultural community from speculation by absentee land owners also hinders long-term investments in farming.

Agricultural land is not only economically important to B.C. and Canada, but it is also an important supplement

Figure 5. CLI agricultural capability of areas classified as undisturbed in 1986-87



to natural wildlife habitat. The amount of existing formally-protected wildlife habitat in the Lower Fraser Valley alone cannot support present wildlife populations (Butler and Campbell 1987). Reducing any further the quality or quantity of remaining unprotected natural habitat would be detrimental to wildlife.

Attempts to recreate habitats such as brackish marshes have been promising but potential sites are limited. To recreate other habitats such as uncultivated old-fields, woodlands, or bogs takes from seasons to decades, with varying degrees of success. Potential sites for such projects are also limited. Given that the area of natural habitat, both protected and unprotected, is unlikely to increase substantially, agricultural lands, especially those adjacent to natural habitats, will continue to be important to wildlife. In turn, habitats such as woodlands and hedgerows serve agricultural land by controlling soil erosion.

Urban encroachment onto prime agricultural land and natural wildlife habitat is largely unnecessary. A little under one-quarter of the Lower Fraser Valley was undisturbed in 1986/87. Of this, 82% had moderate to no capability for agriculture (Figure 5). One study indicates that 22 000 - 40 000 ha of land suitable for urban development exists in the region, most of which is outside of the ALR and still undisturbed. The majority of these areas are located on the uplands bounding the Greater Vancouver Watershed, on the north shore of the Fraser River in Maple Ridge and Mission, on Sumas Mountain, on upland areas of Chilliwack and on isolated woodlots in the rural areas of Surrey and Langley (Agricultural Land Commission 1990a).

Population growth, therefore, can be accommodated in this region without affecting prime renewable resource lands. It can be done both by directing new urban growth to the uplands and marginal lowlands, and by encouraging urban infill and renewal. But a clear commitment to the continued sustainable use of prime renewable resource lands is required. In addition valley-wide planning is essential. The planning process at all levels must regard agricultural land and wildlife habitat as much more than mere developable open space. Instead, they must be recognized as vital components of this region. Only then can the rich and diverse environment of the Lower Fraser Valley be sustained.

Methods

Rural to urban land-use change information was compiled from aerial photograph interpretation under the Urban-Centred Regions component of the Canada Land Use Monitoring Program (CLUMP). Baseline maps of the land activity/cover at a scale of 1:50 000 were prepared for Chilliwack (1980) and Vancouver (1982). Land-use change maps were derived by interpreting 1986 or 1987 air photos, supplemented by field checking. The land use and land-use change maps were then electronically scanned and entered into a computer geographic information system (GIS) by the Environmental

Destruction of habitat from indiscriminate filling and dumping (photo: Gary L. Williams/G.L. Williams and Associates)

Information Systems Division (EISD) of Environment Canada. Land-use information was overlain with maps of the Canada Land Inventory (CLI) agricultural capability (1:50 000 scale). The land use and CLI information was then transferred from the EISD mainframe computer to a PC-based GIS for analysis.

Population statistics for 1980 and 1986 are from Statistics Canada Census information for those years. For the purposes of this study, the Chilliwack Census Agglomeration (CA) statistics were combined with adjacent Census districts to more closely coincide with the Chilliwack UCR boundaries. The Vancouver Census Metropolitan Area statistics were not modified.

View of the Lower Fraser Valley from the delta.
(photo: Dave W. Smith/Canadian Wildlife Service)

References

Borden, C. 1966. Prehistory of the Lower Mainland. Pages 9-26 in Siemens A.H., ed. Lower Fraser Valley - Evolution of a Cultural Landscape. B.C. Geographical Series No.9. Vancouver:Tantalus Research Ltd.

B.C. Agricultural Land Commission. 1990a.Non-farmland With Long Term Urban Potential in the Lower Mainland. Burnaby: Ministry of Agriculture and Fisheries.

B.C. Agricultural Land Commission. 1990b. Personal Communication, B. Smith. Burnaby.

B.C. Ministry of Agriculture and Fisheries, Statistical Services Branch 1990. Personal Communication, A. Wharton. Victoria.

B.C. Ministry of Environment. 1985. Fraser Delta Strategic Environmental Management Plan. Victoria.

Butler, R.W. and R.W. Campbell. 1987. The Birds of the Fraser River Delta: Populations, Ecology and International Significance. Occasional Paper No.65. Ottawa: Environment Canada, Canadian Wildlife Service.

Canada Mortgage and Housing Corporation. 1990a. Housing Market Activity Vancouver CMA/Fraser Valley - August 1990. Vancouver.

Canada Mortgage and Housing Corporation. 1990b. 1989 Canadian Housing Statistics. Ottawa.

Environment Canada. 1976. Land Capability For Agriculture: A Preliminary Report. Canada Land Inventory Report No. 10. Ottawa: Lands Directorate.

Fraser River Estuary Study Steering Committee. 1978. Fraser River Estuary Study: Habitat. Report of the Habitat Work Group. Victoria: Government of Canada/ Province of British Columbia.

Langer, O. E. 1989. Application of the Concept of No Net Loss to the Management of Fish Habitats in the Fraser River. Dept. of Fisheries and Oceans, New Westminster, B.C. Eighth Annual Submerged Lands Management Conference, October 1-6, 1989. South Padre Island, Texas.

Leach, B. 1982. Waterfowl on a Pacific Estuary. Special Publication No.5. Victoria: British Columbia Provincial Museum.

Runka, G. G. 1990. Soil Degradation and Rural Land Use Change: Uplands of Langley and Matsqui Municipalities - Fraser Valley. ARDSA Project #23010. Vancouver: G.G. Runka Land Sense Ltd.

Pilon, P. and M.A. Kerr. 1984. Land Use Change on Wetlands in the Southwestern Fraser Lowland, British Columbia. Canada Land Use Monitoring Program. Working Paper No. 34. Ottawa: Environment Canada, Lands Directorate.

Siemens, A.H. 1966. The Process of Settlement in the Lower Fraser Valley - In Its Provincial Context. Pages 27-49. in Siemens A.H. ed. Lower Fraser Valley - Evolution of a Cultural Landscape. B.C. Geographical Series No.9. Vancouver: Tantalus Research Ltd.

Statistics Canada. 1987. Census of Agriculture - British Columbia. Catalogue No. 96-112. Ottawa.

Statistics Canada. 1988. Census Metropolitan Areas and Census Agglomerations, Part 1. Catalogue No. 94-127. Ottawa.

Warren, C.L., A. Kerr and A.M. Turner. 1989. Urbanization of Rural Land in Canada, 1981-86. State of the Environment Fact Sheet 89-1. Ottawa: Environment Canada, State of the Environment Reporting Branch.

Winter, G. 1986. Agricultural Development in the Lower Fraser Valley. Pages 101-115 in Siemens A.H. ed. Lower Fraser Valley - Evolution of a Cultural Landscape. B.C. Geographical Series No.9. Vancouver: Tantalus Research Ltd.

TECHNICAL REPORT SERIES, CANADIAN WILDLIFE SERVICE

This series of reports, established in 1986, contains technical and scientific information from projects of the Canadian Wildlife Service. The reports are intended to make available material that either is of interest to a limited audience or is too extensive to be accommodated in scientific journals or in other CWS series.

Demand for these Technical Reports is usually confined to specialists in the fields concerned. Consequently, they are produced regionally and in small quantities; they can be obtained only from the address given below. However, they are numbered nationally.

Technical Reports are available in CWS libraries and are listed with the DOBIS system in major scientific libraries across Canada. They are printed in the official language chosen by the author to meet the language preference of the likely audience. **To determine whether there is significant demand for making the reports available in the second official language, CWS invites users to specify their official language preference. Request for Technical Reports in the second official language should be sent to the address given below.**

SÉRIE DE RAPPORTS TECHNIQUES DU SERVICE CANADIEN DE LA FAUNE

Cette série de rapports donnant des informations scientifiques et techniques sur les projets du Service canadien de la faune (SCF) a démarré en 1986. L'objet de ces rapports est de promouvoir la diffusion d'études s'adressant à un public restreint ou trop volumineuses pour paraître dans une revue scientifique ou une autre des séries du SCF.

Ordinairement, seuls les spécialistes des sujets traités demandent ces rapports techniques. Ces documents ne sont donc produits qu'à l'échelon régional et en quantités limitées; ils ne peuvent être obtenus qu'à l'adresse indiqué ci-dessous. Cependant, leur numérotage est effectué à l'échelle nationale.

Ces rapports se trouvent dans les bibliothèques du SCF et figurent aussi dans les listes du système de référence DOBIS utilisé dans les principales bibliothèques scientifiques du Canada. Ils sont publiés dans la langue officielle choisie par l'auteur en fonction du public visé. **En vue de déterminer si la demande est suffisamment importante pour produire ces rapports dans la deuxième langue officielle, le SCF invite les usagers à lui indiquer leur langue officielle préférée. Il faut envoyer les demandes de rapports techniques dans la deuxième langue officielle à l'adresse indiquée ci-dessous.**

FOR FURTHER INFORMATION

Further information and copies of this report may be obtained from:

Canadian Wildlife Service
Pacific and Yukon Region
P.O. Box 340
Delta, British Columbia
Canada V4K 3Y3

Published by Authority of the Minister of Environment
© Minister of Supply and Services Canada
Cat. No. CW69-5/120E
ISBN 0-662-18581-1
ISSN 0831-6481

Cover illustration of the Varied Thrush is by R.W. Butler and may not be used for any other purpose without the artist's written permission.

L'illustration de la couverture (une Grive à collier) est une œuvre de R.W.Butler. Elle ne peut dans aucun cas être utilisée sans avoir obtenu préalablement la permission écrite de l'auteur.

Think recycling

Printed on paper containing recovered waste